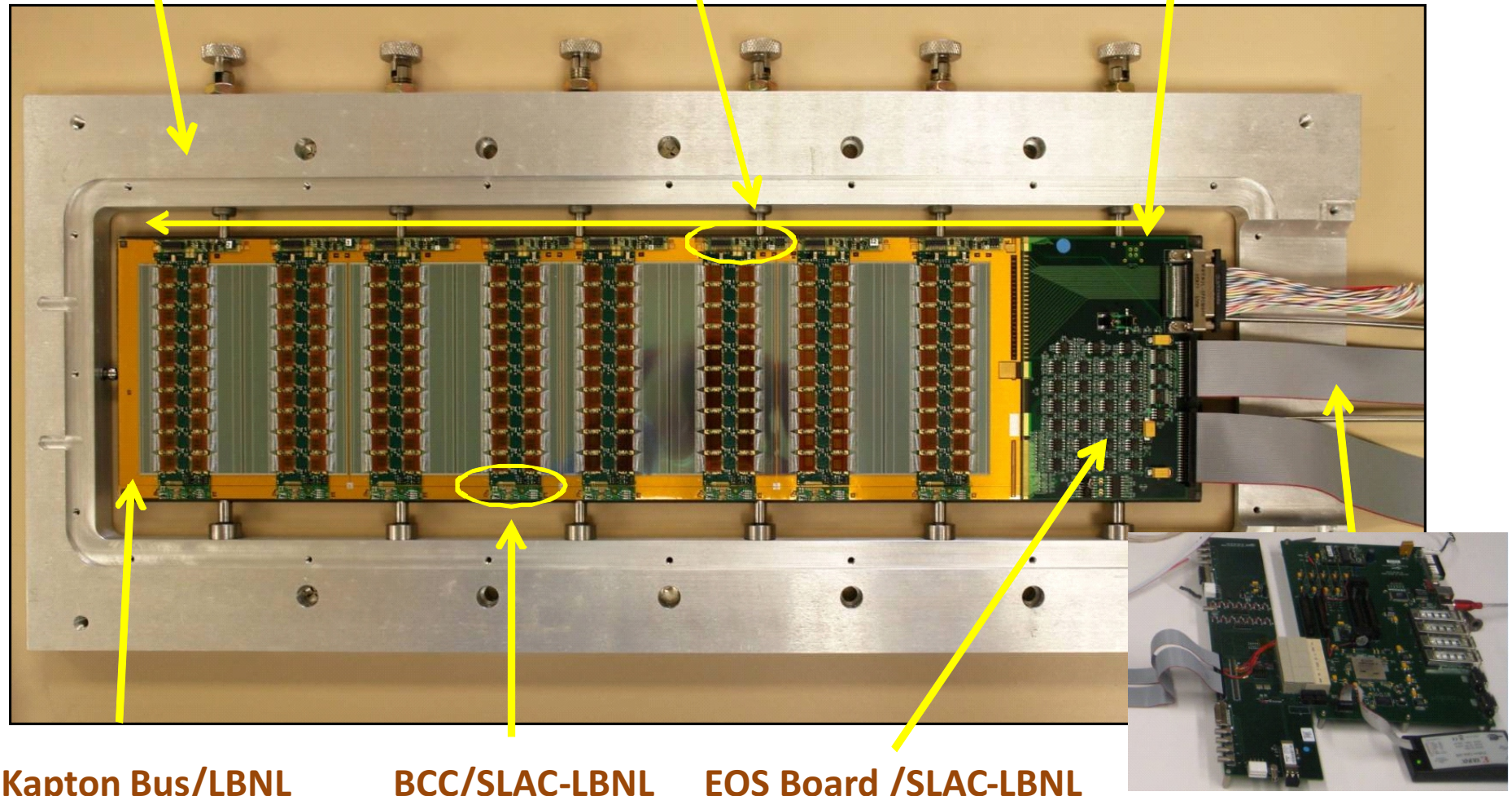
First Stavelet and US Contributions



Serial Power Protection Circuit

Circuit designed by Lynn/Kierstead...layout/testing
by Kuczweski (BNL) and Musso (NYU)

Did not have manpower to make a BNL-led ASIC...Will work with Mitch Newcomer (Penn) on ASIC project. Penn has a series of ASICs planned, BNL to help test.

NIM paper published in 2011. No conference talks.

Nuclear Instruments and Methods in Physics Research A 633 (2011) 51–60

Contents lists available at ScienceDirect

Nuclear Instruments and Methods in Physics Research A

journal homepage: www.elsevier.c om/locate/nima

Serial power protection for ATLAS silicon strip staves

D. Lynn [a,] , J. Kierstead[a], P. Kuczewski [a], M. Weber [b], C. Musso[c], J. Matheson[d], P. Phillips [d], G. Villani [d]

[a] Brookhaven National Laboratory, Upton, NY, USA
[b] Karlsruhe Institute of Technology, Karlsruhe, Germany
[c] New York University, New York, NY, USA
[d] Rutherford Appelton Laboratory, Chilton Didcot, UK

a r t i c l e i n f o

Article history:
Received 15 October 2010
Received in revised form
3 January 2011
Accepted 4 January 2011
Available online 15 January 2011

Keywords:
Serial power
Protection
Silicon
ATLAS
SLHC
Radiation-hard

a b s t r a c t

Upgrades to the inner tracking detectors at the Super Large Hadron Collider (SLHC) will require more efficient methods of power delivery. Serial power is one architecture that delivers power efficiently by powering a chain of front-end circuits (hybrids) with a common current. A major concern with serial power is the loss of the full hybrid chain due to an open circuit failure of a single hybrid. We propose a method to protect a serial chain of hybrids with emphasis on application to the ATLAS silicon strip upgrade. A prototype protection circuit and its discrete component implementation are described. Results from tests of the protection circuit used with individual ''dummy'' hybrids and in a system test with a collection of dummy hybrids are given. Finally, a path towards a radiation-hard ASIC implementation is discussed. This work demonstrates that the protection of a serial chain is viable and is not an obstacle to the implementation of serial power.

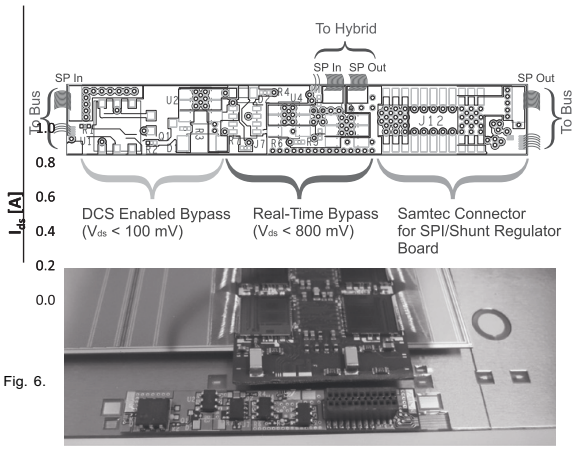


Fig. 6.

Fig. 7. Layout and picture of the power protection board (PPB).

temperature gradient is proportional to the via depth, we made

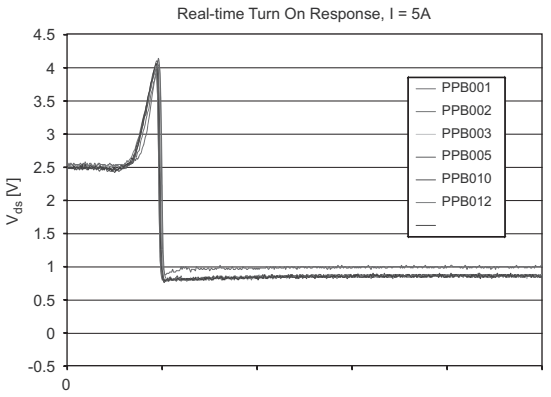


Fig. 9. Real-time bypass response of first seven PPBs.

GaN switches for DC-DC

Buck Converter Development for the Inner Detector Environment of the SLHC Upgrade

S. Dhawan[a], O. Baker[a], H. Chen[b].R. Khanna[c], J. Kierstead[b], F. Lanni[b], D. Lynn[b], C. Musso[d] S. Rescia[b], H. Smith[a],

Abstract— **Future upgrades to the detector subsystems such as calorimeters and inner trackers at the Super-LHC (SLHC) will require more efficient power delivery systems. The combined factors of a harsher environment, limited volume, and increased current make this a challenging task. This paper is a continuation of work that was started in 2007 on the potential use of commercial buck converters at SLHC for efficient power delivery. No commercial buck converters tested have met all electrical and environmental requirements. It has become necessary to consider a custom buck converter design and to qualify and test single components that could be incorporated into an overall design. The approach described here will consider the requirements of the Atlas Silicon Tracker Upgrade as a case study. Promising radiation test data on potential switches is presented as well as an air core inductor design.**

Index Terms— DC-DC Power Conversion, GaN, MOSFETs, Radiation Effects

Project coming to and end (Satish unfunded)

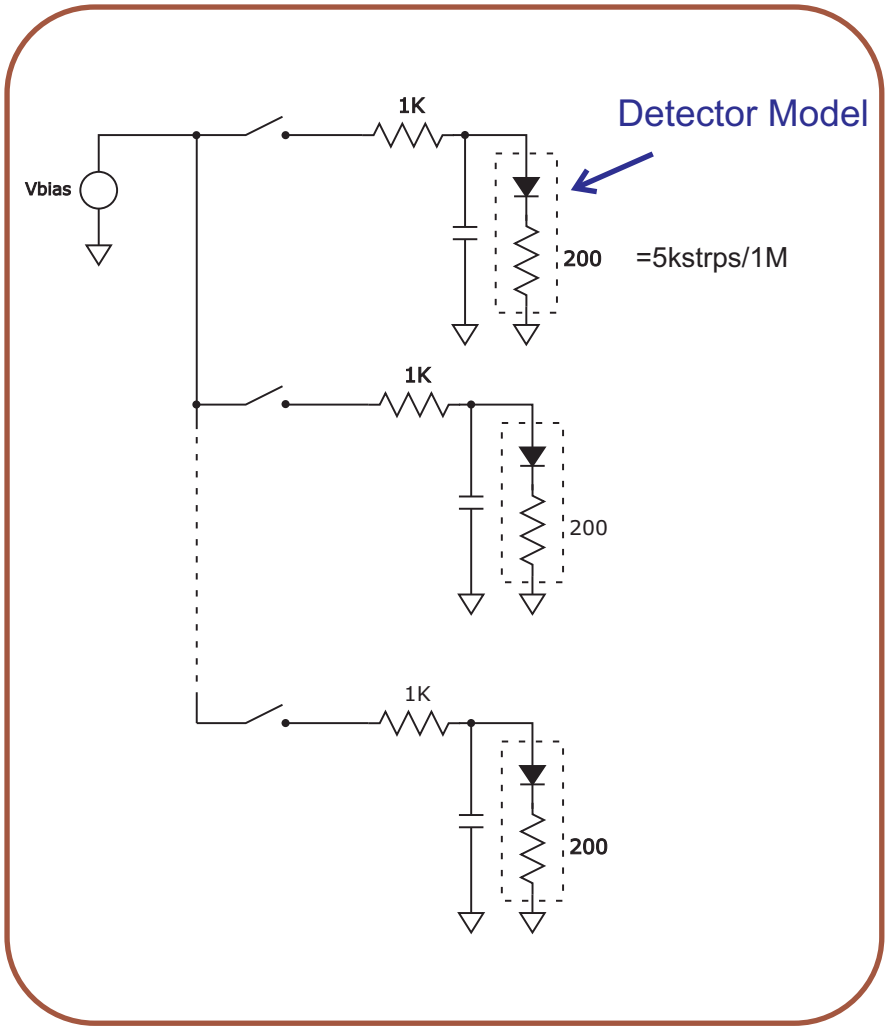
This paper may be published this year.

GaN switches for HV Distribution on Stave

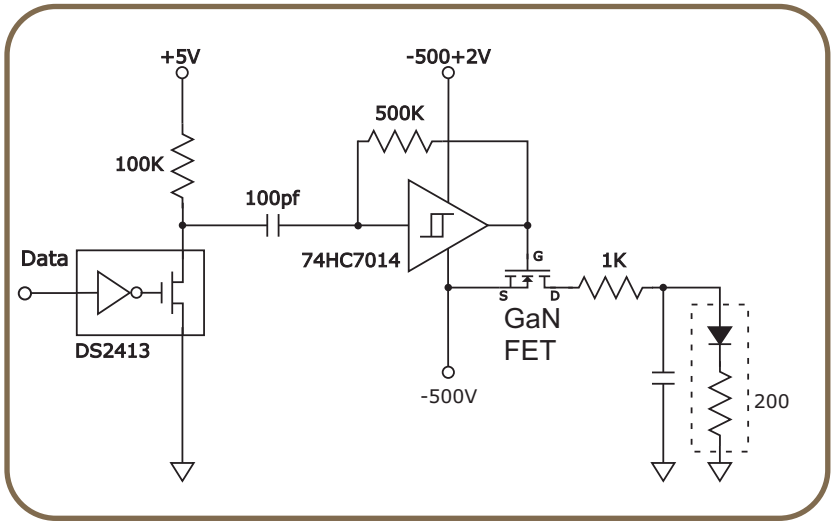
To save cabling, is their any reason why a detector distribution scheme like one below should not be used if it can be made radiation-hard ? It reduces 12 conductors to two, assuming a 1-wire-like serial bus already exists.

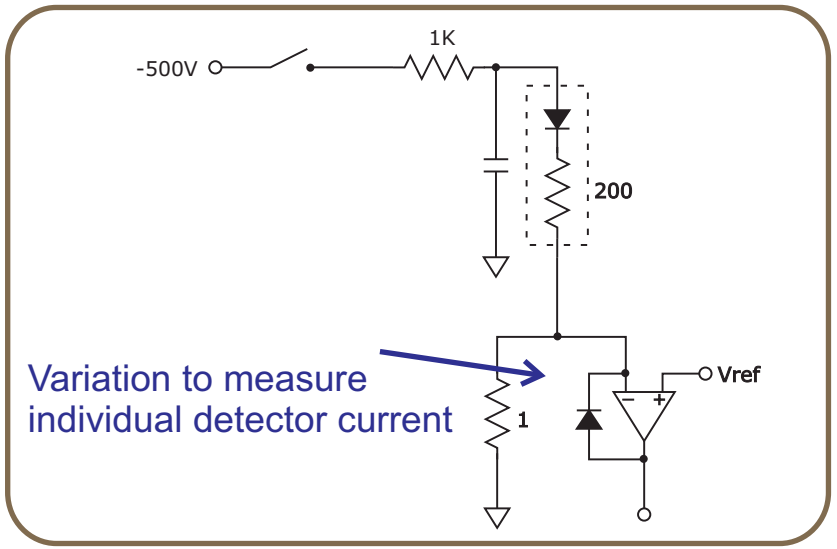
Some GaN FETs rated to 600 V are coming to the market soon and are a potential candiate (information from S. Dhawan).

Proposed Detector Bias Distribution Scheme
Assuming > 500 V Rad-Hard Switches Can be Found



We prototyped this circuit to control via 1-wire a GaN switch that enables/disables each “detector”. Circuit was limited to 100 V operation by GaN Rating





GaN/SiC switches for HV Distribution on Stave

I proposed this at Nov 2010 Atlas upgrade meeting (actually, Mitch gave talk as I had another appointment

Did not get much response

Suddenly over summer it became a hot issue

Just started a mini-collaboration with Santa Cruz, Penn, and LBNL to work on this. Had meeting yesterday.

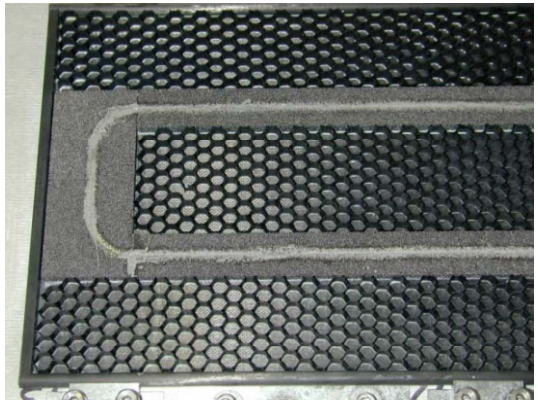
SiC switches have also been identified as a possibility.

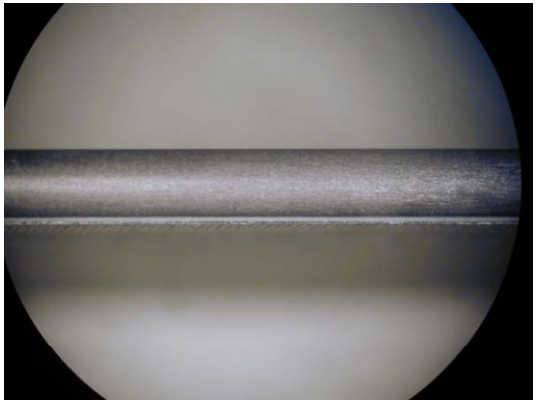
Papers?

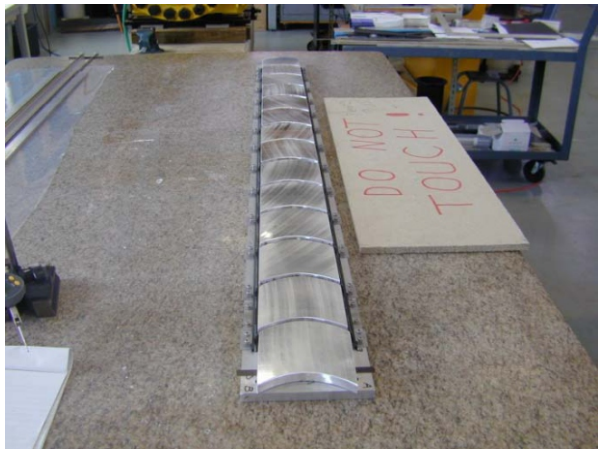
Mechanical Work on Stave Cores

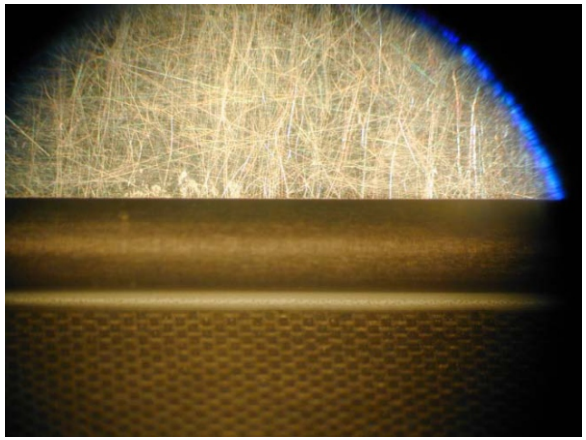
Stave I Progress

- Moving slower than originally expected, but we are being very careful
- Trying new techniques than those used on last year's 1 meter stave
- CF tube-facing glue joints very nice
- Stave being ground at Yale, to return to BNL next week for final facing attachment.

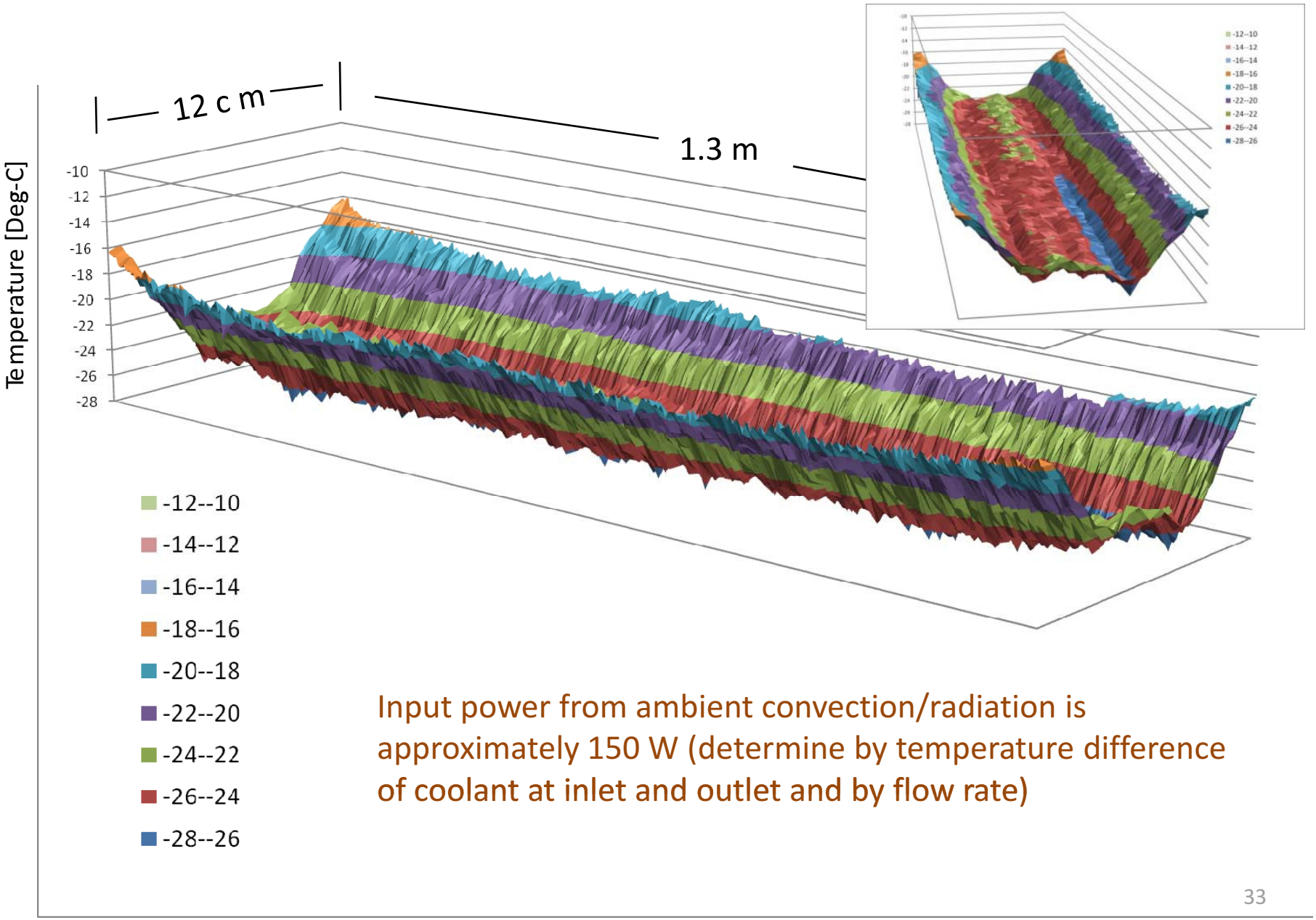




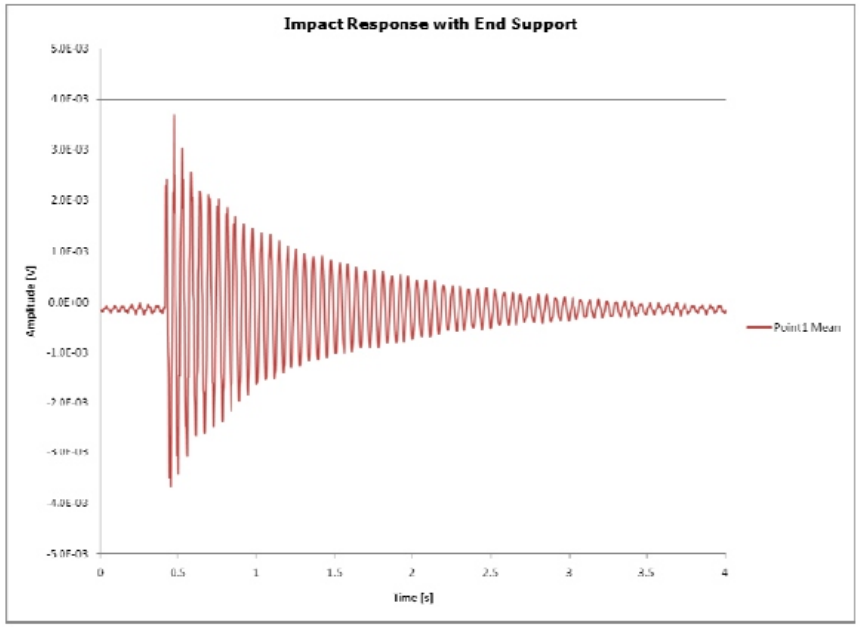




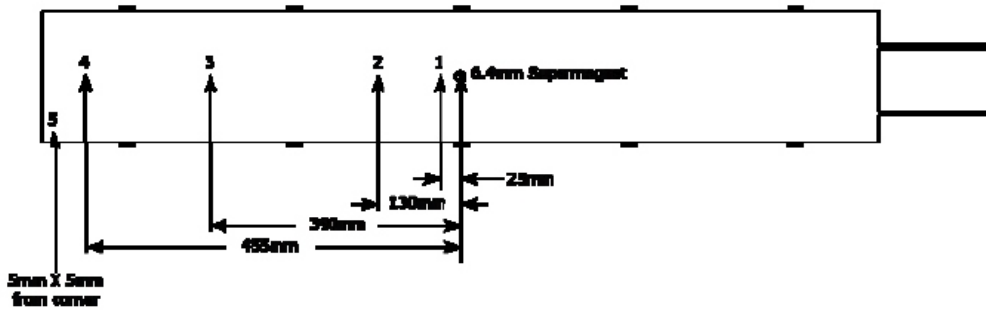
Temperature Profile of 1.3 m x 12 cm Stave



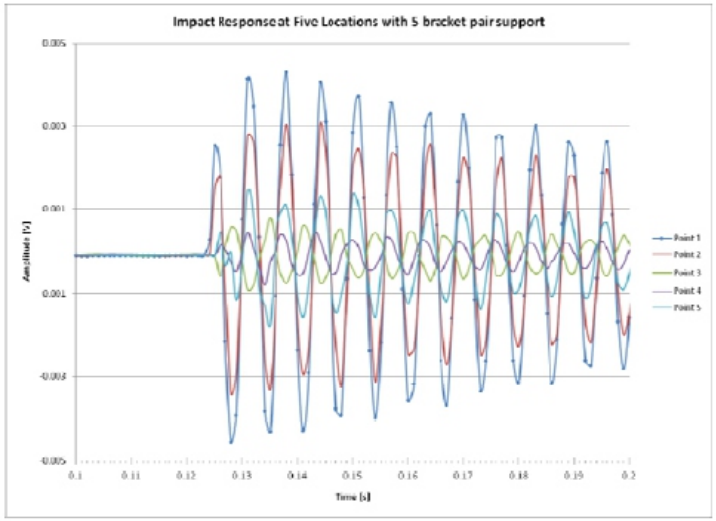
Input power from ambient convection/radiation is approximately 150 W (determine by temperature difference of coolant at inlet and outlet and by flow rate)

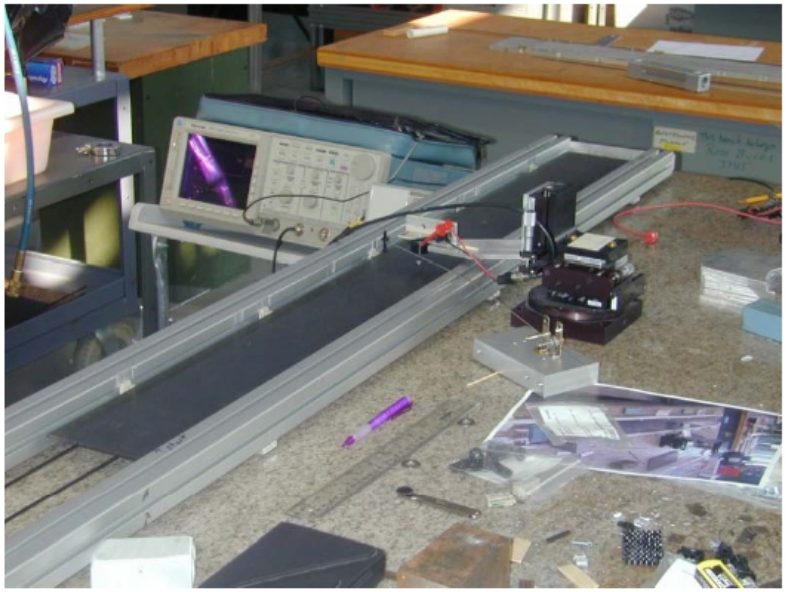


Impact points for *10* contact support

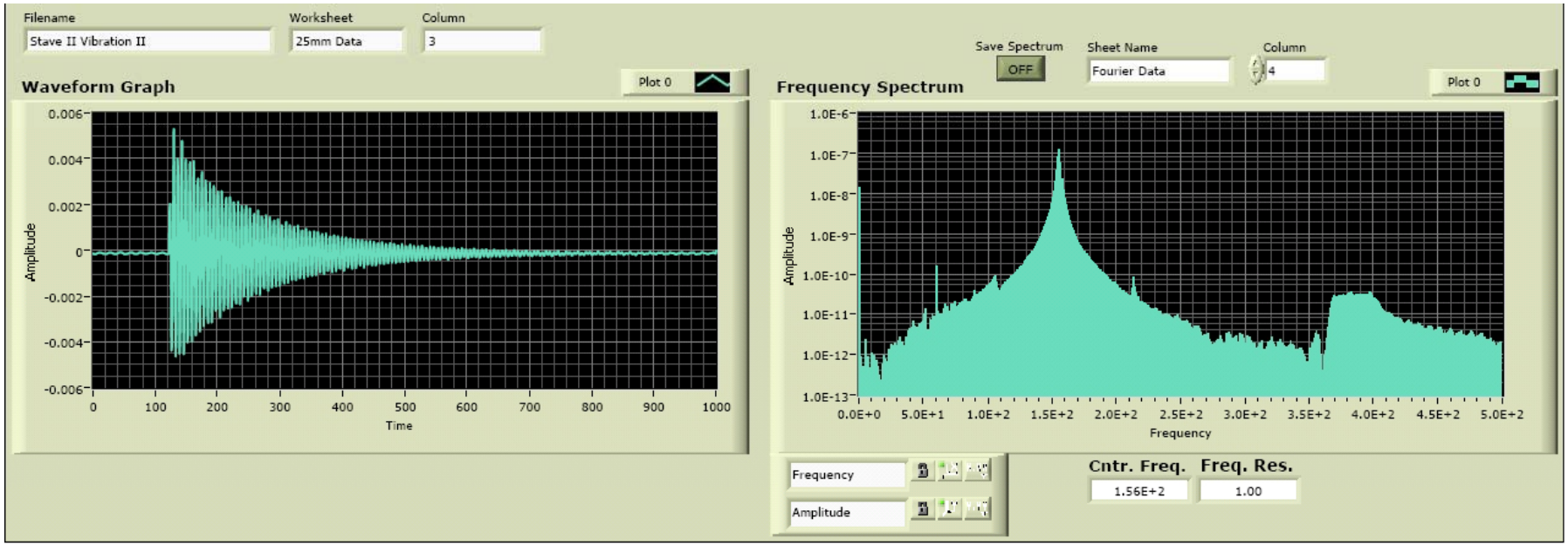


	Impact Response [Hz]	Noise Response [Hz]
End Support	18	18
5 Bracket Support	156	60

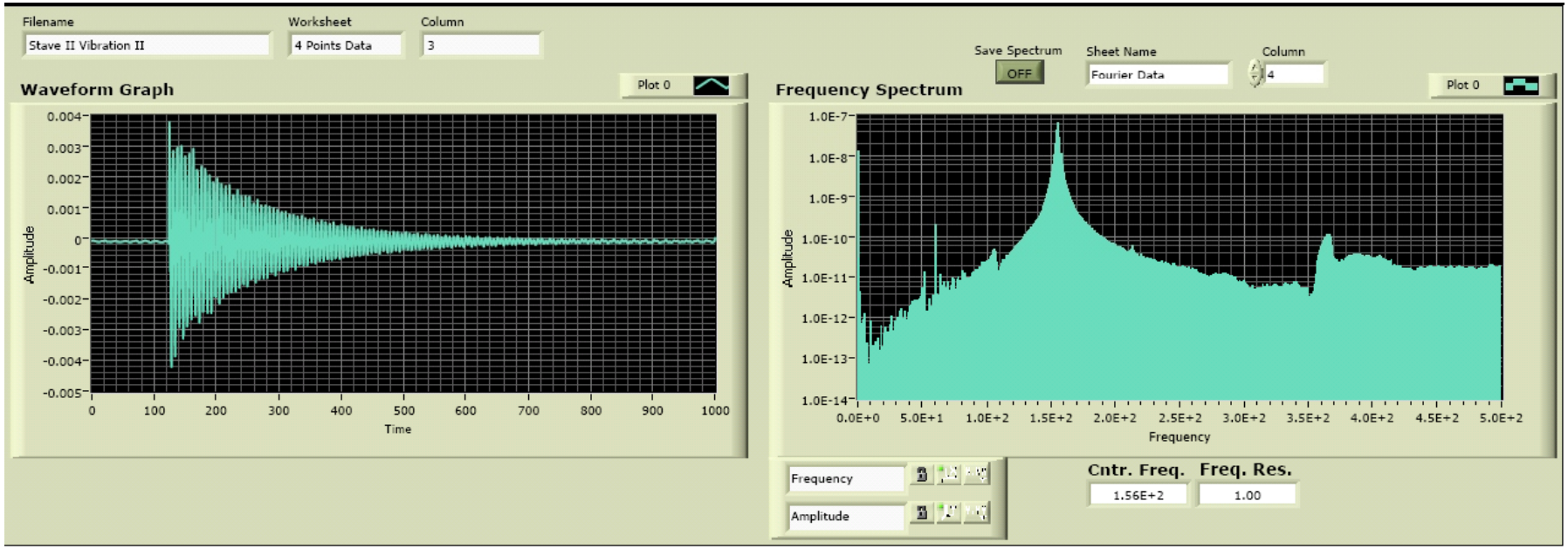




1


Filename
Stave II Vibration II
Worksheet
25mm Data
Column
3
Waveform Graph
Plot 0
Amplitude
Time
Save Spectrum
OFF
Sheet Name
Fourier Data
Column
4
Frequency Spectrum
Plot 0
Amplitude
Frequency
Frequency
Amplitude
Cntr. Freq.
1.56E+2
Freq. Res.
1.00

2

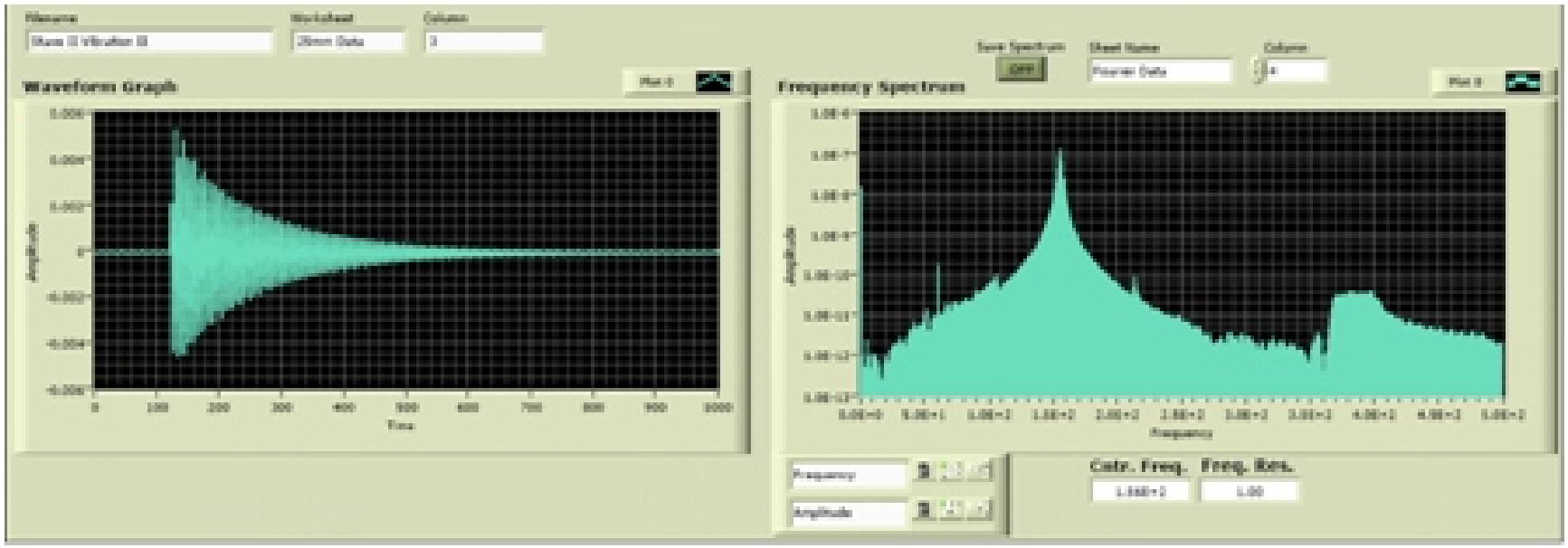

Filename
Stave II Vibration II
Worksheet
4 Points Data
Column
3
Waveform Graph
Plot 0
Amplitude
Time
Save Spectrum
OFF
Sheet Name
Fourier Data
Column
4
Frequency Spectrum
Plot 0
Amplitude
Frequency
Frequency
Amplitude
Cntr. Freq.
1.56E+2
Freq. Res.
1.00

Mechanical work is generic, but targeted towards atlas

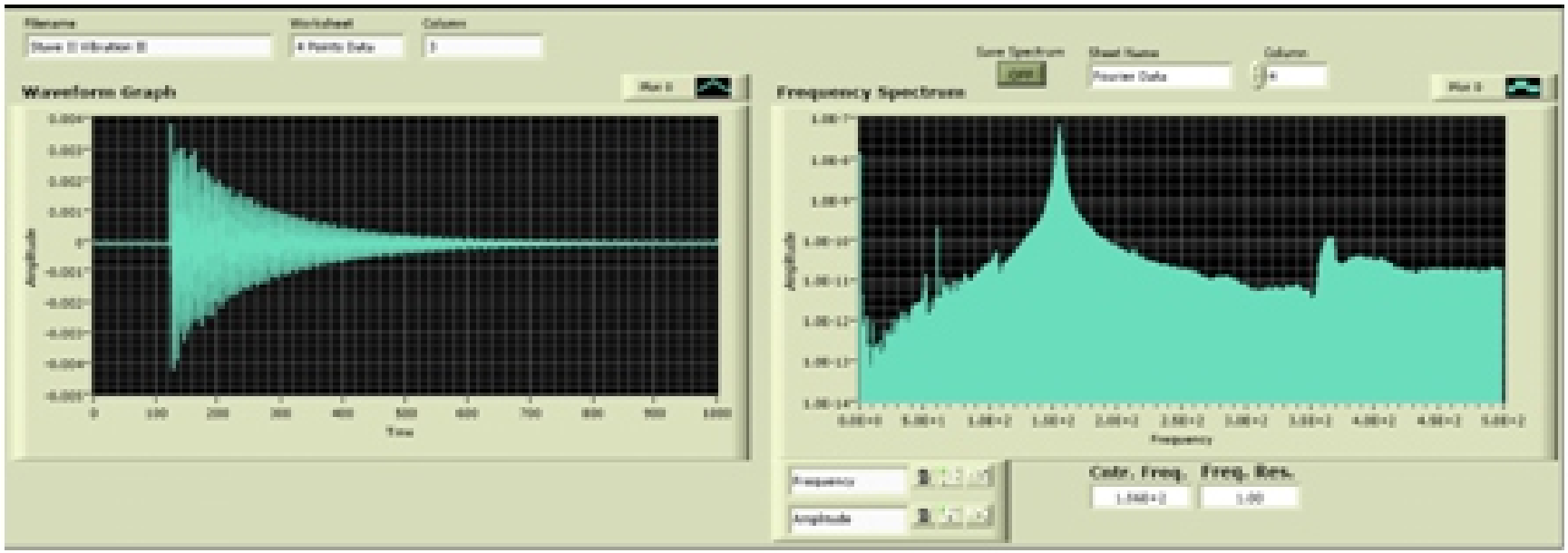
Not sure anything fits into a paper (work is too broad).

Had originally intented to write paper on short stavelet thermal studies, but FEA and data diverged....and don’t have the time...mechanical work is falling behind that of UK

1


Waveform Graph
Frequency Spectrum
Save Spectrum
OFF
Sheet Name
Fourier Data
Column
Plot 0
Amplitude
Time
Frequency
Cntr. Freq.
Freq. Res.

2


Waveform Graph
Frequency Spectrum
Save Spectrum
OFF
Sheet Name
Fourier Data
Column
Plot 0
Amplitude
Time
Frequency
Cntr. Freq.
Freq. Res.